



## Effects Of Inhaled Corticosteroids On Condylar Head Of Mandible In Asthmatic Patients

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### Abstract :

**Background :** “Inhaled corticosteroids” are widely used and more efficient in management of asthma and chronic obstructive pulmonary disease. There are undesirable consequences on human bones associated to long-term treatment of corticosteroids. Several studies observed many variations that may affect the human condyles but little studies monitored effect of “inhaled corticosteroids” on these bones.

**Aim of study :** To observe if long-term use of inhaled corticosteroids influence mandibular condylar head in patients with asthma on CBCT image.

**Materials and Methods :** A study undertaken on “70 individuals” between ages 25-40 years who referred to Dental centers in Iraqi Capital for taking CBCT images of jaws between 5/2014 to 10/2016. Selected patients (35 case) have “mild to severe asthma and treated with inhaled corticosteroids used at least two times per day and for period of at least two years”. Other selected individuals (35 case) have a good health status. Linear measurements of mandibular condylar head carried out on CBCT images. Measurements included condylar head width and length on both of left and right condyle.

**Conclusion :** There was no influence on condylar head of mandible in patients after using long-term inhaled corticosteroids.

**Keywords :** Corticosteroids, Inhaled-corticosteroids, Asthma, mandibular condylar head

### 1. Introduction

Temporomandibular joint consider one of the main joints in the human body, and it has a nigh relation to dentition and stomatognathic area <sup>(1)</sup>. Temporomandibular joint has numerous characteristics related to function and anatomy which give it particular features <sup>(2,3)</sup>. It composed of different parts which are believed to be included in preserving TMJ ability in re-modeling when development stopped also renew its configuration later <sup>(4)</sup>. Mandibular condylar part of TMJ regarded as the essential center of mandibular jaw functions <sup>(5)</sup>. Its function and situation affected by many factors as nigh muscle <sup>(1)</sup>. Morphology of condyle is distinguished as a round bone prominence, the higher part is concave on both side and elliptical in axial plane. In usual, a frontal distance of condylar head is longer than lateral distance <sup>(6)</sup>. It is measured about 15 - 20 mm laterally and 8 - 10 mm from frontside to backside <sup>(7)</sup>.

#### 1.1 “Inhaled corticosteroids”

For a long-term, “Inhaled corticosteroids” are the drugs of choice in treating bronchial “asthma” as well sever cases in last years in matured individuals in different countries <sup>(8-12)</sup>. Yet, these drugs have several prospective undesirable consequences “systemic and local influences” <sup>(13,14)</sup>. It is seem that low dosages of inhaled corticosteroids have a lesser effect on action of osteoclasts and osteoblasts, in contrast, they have adverse effects in case of high dosages for a long period <sup>(15,16)</sup>. In spite of systemic adverse results are minimal with inhaled corticosteroids, but these effects actually will be massive in large dosages as Cushing symptoms, cataracts, reduction in production of steroid hormones by adrenal gland, contusion of skin, osteoporosis and progress retardation in children <sup>(17,14)</sup>.

#### 1.2 TMJ imaging

Imaging assessment of bony changes and abnormalities that affect the TMJ considered as a valuable significant mean <sup>(18)</sup> 33. Many radiographic and imaging methods applied to study the TMJ morphology <sup>(19-22)</sup> 23,24,25,26. Panoramic imaging could examine most of alterations in mandibular condyle in persons have TMJ complains <sup>(23)</sup> 34. In spite of this radiography broadly used at diagnostic practice, but it restricted to assess precision of mandibular condyle configuration or bone condition <sup>(24)</sup> 35. Thence, extreme care must be taken with panoramic imaging through carrying out dimension measurements <sup>(19,25)</sup> 23,36.

Computed Tomography provides details involving bone evaluation <sup>(22,24,26-31)</sup>. Bi-planar tomography gives more exact analysis of condylar lesions than bi-planar OPG images <sup>(32)</sup> 39. Studies showed that computed tomographic images can be considerably exact

for measurements of linear <sup>(22,33,34)</sup> 26,45,46 volumetric <sup>(35)</sup> 47 and geometric <sup>(34)</sup> 46 within the maxillofacial region. Traditional tomography is more advanced than MRI in evaluation of bony alterations in TMJ <sup>(36)</sup> 40. MRI also considered the most choice in assessing changes in the soft tissue of TMJ <sup>(26-30,37)</sup> 27-29,31,32,44. Many studies later, stated that cone beam computed tomographic images (CBCT) are more superior than other imaging systems for showing bony condition in mandibular condyle and diagnose the cortical surface of condyle for any attrition <sup>(19,22,38)</sup> 26,41,42. Cone beam computed tomography is a helpful tool to assess and measure the condylar measurements <sup>(39)</sup>. Other study also stated that cone beam computed tomographic images give a good visualization of temporomandibular joint bone tissue than other imaging devices <sup>(40)</sup>.

### 1.3 “Consequences of Corticosteroids”

Effects of these drugs on action of “osteoclast” are argumentative, on other hand, these consequences were most likely interposed on “osteoblasts” causing “bone resorption”. They also essentially stop the road on calcium transit by “enterocytes”, in addition, they influence action or metabolism of Vit. D, plus secondary repressive influence Ca re-absorption by kidney, creating a high concentration of calcium in blood. Furthermore, these drugs have secondary consequences on human bones by modifying of some “hormones” activity. During first dosages, these drugs raise “parathyroid hormone” action, this may be due to reduction in the transport process of intestine and over renal lack of calcium; a well, there is proof that corticosteroids promote the parathyroid hormone action on osteoblasts. Many studies stated that they more possibly cause significant influences on local couriers of cells through osseous structure, including expansion factors and cytokines <sup>(41-43)</sup>.

Glucocorticoids raise fracture rate of bone, particularly at spongiosa regions. Sometimes, the risk of fractures happen with high bone density in those on glucocorticoids which are more occurred than do similar fractures related with influential post-menopausal osteoporosis. As well, with minimal oral dosages, its reported to be associated with adverse results on bone <sup>(44)</sup>. Moreover, it had found that powerful corticosteroids “inhaled or topical” given in large dosages might be associated with undesirable significant influences like resorption of bone <sup>(45)</sup>.

## 2. Material and Methods

A study undertaken on “70 individuals” between the ages 25-40 years who referred to Dental centers in Iraqi Capital for taking CBCT images of jaws between 5/2014 to 10/2016. Selected patients (35 case) have “mild to severe asthma and treated with inhaled beclomethasone 100-250 mcg or budesonide 200 mcg or fluticasone propionate 125-220 mcg used at least two times per day and for period of at least two years”. Other selected individuals (35 case) have a good health status. Individuals are reported of probability that the results may be used for research objectives.

### 2.1 Criteria of Individual's Selection :

1. No history of : Osteoporosis, Hyperparathyroidism, Cushing syndrome, Diabetes Mellitus or any disease affect the metabolism of bone.
2. No taking for some drugs as Bisphosphate, Vitamin D, estrogen, Calcium and parathyroid hormone.
3. No previous history of maxillofacial trauma.
4. No facial deformity and asymmetry.
5. No previous maxillofacial surgery.
6. With no orthodontic treatment and dental prosthesis.
7. No Mandibular and maxillary 3<sup>rd</sup> molar impaction
8. All individuals should be at most normal occlusion.
9. No history of condylar fracture or resorption.
10. No TMJ ankyloses, hyperplasia and tumors.
11. No joint diseases.

### 2.2 Measurements of condylar dimensions :

For each selected individual (patients and healthy individuals), Thirty five CBCT images of jaws were taken, so that the total number of TMJ images included in the study were seventy images for patients group and seventy images for control group. The linear measurements were carried out on the CBCT images of TMJ.

These measurements used to determine the maximum distances between specific anatomical points on the condylar head of mandible. This done by measuring the maximum distances on the condylar images in lateral and frontal views. The anatomic landmarks, anatomic points and linear measurements included in this study were based on Schlueter et al <sup>(35)</sup> criteria as follows :

- » **M-L:** Represent a condylar width, which is the distance between M and L points, referring to a maximal dimension of the condylar head of mandible on frontal view. (Figure 1-A)
- » **A-P :** Represent a condylar length, which is the distance between A and P points, referring to a maximal dimension of the condylar head of mandible on lateral view. (Figure 1-B)
- » **M :** Represent a medial condylar surface which is most high medial point of condylar head of mandible on frontal view.
- » **L :** Represent a lateral condylar surface which is the most high lateral point of condylar head of mandible on frontal view.
- » **A :** Represent an anterior condylar surface which is the most high anterior point of condylar head of mandible on lateral view.
- » **P :** Represent a posterior condylar surface which is the most high posterior point of condylar head of mandible on lateral view.

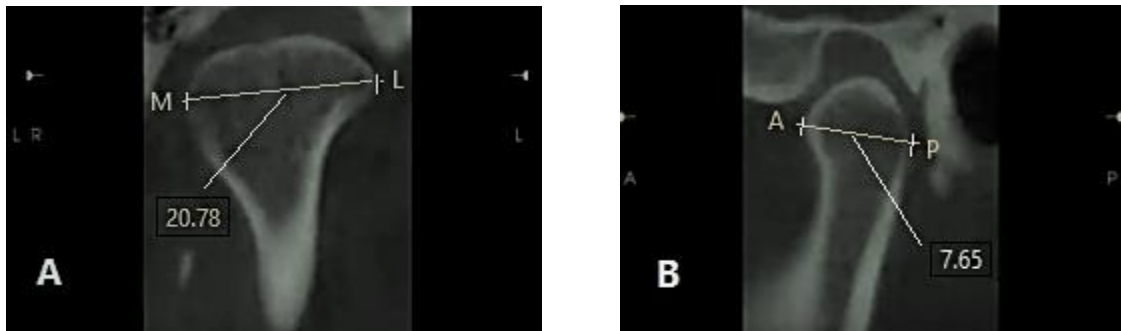


Figure 1: Linear measurements on frontal (A) and lateral (B) views of the left mandibular condyle (M: medial, L: lateral, A: anterior, P: posterior)

### 3. Results :

An average A-P distance of healthy group was 7.80 mm and 7.63 mm in patients group, while an average M-L distance of healthy group was 20.81 mm and 20.49 mm in patients group.

Statically analyses showed no significant difference of a whole average of A-P and M-L distances (both gender) in comparing between the two groups. (Table 1).

Table 1. Average linear measurements of the mandibular condylar head in patient and healthy group :

Groups	Gender	A-P distance (mm)	M-L distance (mm)
Healthy	M	7.84 ± 0.50	21.40 ± 1.28
	F	7.76 ± 0.54	20.23 ± 1.41
	Total	7.80 ± 0.52	20.81 ± 1.34
Patients	M	7.69 ± 0.48	20.93 ± 0.61
	F	7.58 ± 0.56	20.05 ± 1.25
	Total	7.63 ± 0.52	20.49 ± 0.93
P-value	M	0.2	0.054
	F	0.1	0.57
	Total	0.0551	0.1

#### 4. Discussion :

Many researchers tried to assess mandibular condylar. Changes in the shapes of human condyle were observed by previous study<sup>(46)</sup>. It has been observed that many of the normal changes of condylar morphology occurred due to many factors as gender, age, facial and malocclusion type, occlusal and functional force, in addition to right and left condyles<sup>(47)</sup>.

On other side, Hasegawa stated that alterations in status and extent of condyle differ depending on prior posture of meniscus<sup>(48)</sup>, another study stated that shape of condyle was correlated to age of individual<sup>(49)</sup>.

Some researchers stated that inhaled corticosteroids may or not influence bone formation and resorption in different ages<sup>(50-55)</sup>, but many researchers concluded that if oral corticosteroids taken for a long time in patients with asthma, this cause remarkable reduction in Ca absorption and marked bone resorption<sup>(56-59)</sup>.

Another study found that there was marked decrease in bone consistency in patients with asthma treated with high dose corticosteroids for three to five years treatment in opposite to patients taking no or less dose<sup>(60)</sup>.

This study observed the possible effects on human condyles at asthmatic patient after long term use of inhaled corticosteroids using cone-beam computed tomography.

Linear measurements carried out through both right and left mandibular condyles of asthmatic and healthy individuals (Both genders) by using CBCT images, so the lateral views used to measure the antero-posterior distance (AP) while the frontal views used to measure the medio-lateral distance (ML). Statistical analyses found that there was no significant effect on these distances when we compared the total average of both distances between healthy individuals and inhaled corticosteroid treated asthmatic patients. These conclusions are somewhat similar to several studies<sup>(61-64)</sup>.

The possible reasons of these results are absorption of inhaled corticosteroids in healthy individuals may be faster than patients with pulmonary disease<sup>(65)</sup>. Other possible causes may be due to varied techniques in corticosteroids inhalation, varied means used in corticosteroids inhalation, in addition to different procedures of inhalation means, in turn all of these factors may affect corticosteroid levels transmitted to lungs and in turn into GIT<sup>(66)</sup>.

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